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FORM PTO-1700
(REV 11-99)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEYS DOCKET NUMBER

**TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371**

4322/PCT

U.S. APPLICATION NUMBER (DO/EO/US)
(unknown - to be assigned) **10/088583**

INTERNATIONAL APPLICATION NO
PCT/DE00/02828

INTERNATIONAL FILING DATE
18.August 2000 (18.08.00)

PRIORITY DATE CLAIMED
18.September 1999 (18.09.99)

TITLE OF INVENTION
Filter Press

APPLICANT(S) FOR DO/EO/US

Wilhelm CLAESSEN; Karl GRAFEN; Hermann-Josef SPOELGEN; Menrad WESP

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1)
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)) with Translator's Declaration.
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau)
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired
 - d. ☒ have not been made and will not be made
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98, Form PTO-1449, copy of International Search Report & English Version thereof.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included
13. ☒ A **FIRST** preliminary amendment, to minimize the filing fee.
☒ A **SECOND** or **SUBSEQUENT** preliminary amendment
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information:
 - a) return receipt postcard;
 - b) Form PTO-2038;
 - c) 5 Figs. on 3 sheets of formal drawings

NOTE: The priority of German Patent Application 199 44 848.5, filed in the Federal Republic of Germany on September 18, 1999 is claimed for the under 35 U.S.C. §119,

NOTE: The entire disclosure of PCT International Application PCT/DE00/02828 is incorporated herein by reference.

NOTE: This Application has been assigned to: Outokumpu Oyj of: Riihitontuntie 7D, 02201 Espoo, Finland. The Assignment is being submitted herewith for recordal.

USPS EXPRESS MAIL

EV 059 670 734 US
MARCH 18 2002

1010 RECEIVED PTO 18 MAR 2002

U.S. APPLICATION NO. (known) 10/028283 (unknown) to be assigned		INTERNATIONAL APPLICATION NO. PCT/DE00/02828		ATTORNEY'S DOCKET NUMBER 4322/PCT																	
17. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$920.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$890.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$700.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$670.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) \$90.00 ENTER APPROPRIATE BASIC FEE AMOUNT =				CALCULATIONS PTO USE ONLY																	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$ 890.00																	
<table border="1"><thead><tr><th>CLAIMS</th><th>NUMBER FILED</th><th>NUMBER EXTRA</th><th>RATE</th></tr></thead><tbody><tr><td>Total claims</td><td>14 - 20 =</td><td>0</td><td>X \$18.00</td></tr><tr><td>Independent claims</td><td>1 - 3 =</td><td>0</td><td>X \$78.00</td></tr><tr><td colspan="3">MULTIPLE DEPENDENT CLAIM(S) (if applicable)</td><td>+ \$260.00</td></tr></tbody></table>				CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	Total claims	14 - 20 =	0	X \$18.00	Independent claims	1 - 3 =	0	X \$78.00	MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$260.00	\$ 0	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE																		
Total claims	14 - 20 =	0	X \$18.00																		
Independent claims	1 - 3 =	0	X \$78.00																		
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$260.00																		
TOTAL OF ABOVE CALCULATIONS =				\$ 890.00																	
Reduction of 1/2 for filing by small entity, if applicable. A Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).				\$ 0																	
SUBTOTAL =				\$ 890.00																	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$ 0																	
TOTAL NATIONAL FEE =				\$ 890.00																	
Fee for recording the enclosed assignment (37 CFR 1.21(h)) The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				\$ 40.00																	
TOTAL FEES ENCLOSED =				\$ 930.00																	
				Amount to be:																	
				refunded																	
				charged																	

a. ☒ Form PTO-2038 (Credit Card Payment Form)
~~Check~~ in the amount of **\$ 930.00** to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed

c. ☒ The Commissioner is hereby authorized to charge any/deficiency in or overpayment to Deposit Account No. **50-0207** additional fees which may be required, or credit any. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO

CUSTOMER NO.: 021553

Walter F. Fasse - 03/18/02

SIGNATURE
Walter F. Fasse

NAME
36132

REGISTRATION NUMBER

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EV 059 670 734 US
MARCH 18 2002

10095107 10/088583

JC10 Rec'd PCT/PTO 18 MAR 2002

DOCKET NO.: 4322/PCT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN THE MATTER OF THE PCT NATIONAL PHASE PATENT APPLICATION

OF: Wilhelm CLAESSEN et al.

USSN: TO BE ASSIGNED - NEW

FILED: March 18, 2002

FOR: Filter Press

INTERNATIONAL SERIAL NO.: PCT/DE00/02828
INTERNATIONAL FILING DATE: 18. August 2000 (18.08.2000)

ASSISTANT COMMISSIONER FOR PATENTS
BOX PCT
WASHINGTON, D.C. 20231

March 18, 2002

SECOND PRELIMINARY AMENDMENT

Dear Sir:

After granting a filing date and calculating the filing fee for this new patent application, but before the first examination, please amend the application as follows.

In the Claims:

Claims 1 and 2 are maintained unchanged.

Claims 3 to 14 have been previously cancelled.

Please enter new claims 15 to 26 as follows.

1 15. (new) A filter press as claimed in claim 1, characterized
2 in that the lifting elements (14) are provided with
3 receiving elements whose central distance corresponds to

4 the distance of the carriers (21) of the reversing bodies
5 (10) which is present when two adjacent filter plates (6)
6 are spaced at a distance which is defined by the connecting
7 brackets, with the total number of filter plates (6)
8 corresponding to an integral multiple of the number of the
9 receiving elements of the lifting elements (14).

1 **16.** (new) A filter press as claimed in claim 15, characterized
2 in that the carriers (21) are arranged as pins and the
3 receiving elements (18) are arranged as tappets which
4 extend in an upwardly perpendicular manner from a
5 horizontally aligned basic body (19) of the lifting element
6 (14).

1 **17.** (new) A filter press as claimed in claim 1, characterized
2 in that the lifting elements (14) comprise recuperating
3 elements (23) which produce a positive-locking connection
4 with the carriers (21) during the downward movement of the
5 lifting elements (14).

1 **18.** (new) A filter press as claimed in claim 2, characterized
2 in that the lift-truck (12) is provided with an unlatching
3 device (25) which is adjustable vertical to the same,
4 whereby a switching force for unlatching the connecting
5 brackets can be exerted between mutually adjacent filter
6 plates (6) by means of the contact surfaces (27) of the

unlatching device (25) on the switching surfaces of connecting brackets which are flexibly connected to a filter plate (6) each.

19. (new) A filter press as claimed in claim 18, characterized in that the contact surfaces (27) are arranged as runners and the unlatching device (25) can be swivelled by means of a fluid cylinder (26) from an idle position in which the contact surfaces (27) are disposed above the switching surfaces to a switching position in which the connecting brackets are unlatched.

20. (new) A filter press as claimed in claim 1, characterized in that at least one spray pipe (24) is flexibly mounted on the lifting element (14), which spray pipe can be transferred from an idle position in which it is disposed vertically and completely outside of a projection of the filter plates (6) in the longitudinal direction of the filter press (1) to a cleaning position in which it is approximately horizontal, with filter cloths (7K, 7M) being chargeable over their entire width with a pressurized cleaning liquid emerging from the nozzles of the spray pipe (24) under pressure.

21. (new) A filter press as claimed in claim 20, characterized in that the number of filter cloths (7) which can be cleaned during a lifting movement is smaller than the number of receiving elements (18) present on a lifting element (14).

23. (new) A filter press as claimed in claim 1, characterized in that a transport device (28) for displacing one or several filter plates (6) is fastened to the lifting apparatus when the same is stationary in the longitudinal direction of the filter press (1).

24. (new) A filter press as claimed in claim 18, characterized in that a transport device (28) for displacing one or several filter plates (6) is fastened to the lifting apparatus when the same is stationary in the longitudinal direction of the filter press (1), and the transport device (28) for the cake discharge is fastened to the unlatching device (25) of the lift-truck.

25. (new) A filter press as claimed in claim 2, characterized in that the lift-truck (12) is provided with a latching device with which the filter plate (6) which is adjacent to the section of filter plates (6) currently to be emptied can be fixed relative to the lift-truck (12).

26. (new) A filter press as claimed in claim 18, characterized in that a carrier (34) which is fastened to the unlatching

3 device (25) can be brought into engagement with a tappet
4 (31) of the filter plates (6).

REMARKS:

- 1) New claims 15 to 26 correspond respectively to original translated PCT claims 3 to 14, but merely omit the multiple dependent back references. Thus, no new matter is introduced by the present amendment. Other informalities, if any, in the literally translated PCT application text, will be addressed later during the prosecution.
- 2) Examination of the present application is to proceed on the basis of claims 1, 2 and 15 to 26. It is noted that the International Preliminary Examination report found that all of the corresponding PCT International Claims satisfied all criteria for patentability.
- 3) Favorable consideration and allowance of claims 1, 2 and 15 to 26 are respectfully requested.

Respectfully submitted,

Wilhelm CLAESSEN et al.
Applicant

WFF:ar/4322/PCT
Encls.: postcard

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JC10 Rec'd PCT/PTO 1 8 MAR 2002

DOCKET NO.: 4322/PCT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN THE MATTER OF THE **PCT NATIONAL PHASE PATENT APPLICATION**

OF: Wilhelm CLAESSEN et al.

USSN: TO BE ASSIGNED - NEW

FILED: March 18, 2002

FOR: Filter Press

INTERNATIONAL SERIAL NO.: PCT/DE00/02828
INTERNATIONAL FILING DATE: August 18, 2000

ASSISTANT COMMISSIONER FOR PATENTS
BOX PCT
WASHINGTON, D.C. 20231

March 18, 2002

FIRST PRELIMINARY AMENDMENT TO MINIMIZE THE FILING FEE

Dear Sir:

In order to minimize the filing fee, please amend the above identified patent application as follows before calculating the filing fee.

Referring to the Literal Translation of International Application
PCT/DE00/02828

In the Claims:

Please cancel claims 3 to 14.

Claims 1 and 2 are maintained for calculating the filing fee.

REMARKS:

After calculating the filing fee, please further enter the accompanying Second Preliminary Amendment which adds new claims 15 to 26 for examination.

Respectfully submitted,
Wilhelm CLAESSEN et al.
Applicant

WFF:ar/4322/PCT
Encls.: postcard

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MARCH 18 2002

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IC10 Rec'd PCT/PTO 1 8 MAR 2002

3/p/RTS

1

Docket # 4322/PCT
INV.: Wilhelm CLAESSEN
Karl GRAFEN
Hermann Josef SPOLGEN
Menrad WESP

A filter press

The invention relates to a filter press for filtering suspensions, consisting of a holder, a support plate fixed thereto, a displaceable pressure plate and a packet of vertical filter plates which are arranged between the support plate and the pressure plate, with each filter chamber situated between two filter plates each comprising at least one filter cloth which is guided in an S-shaped manner around two horizontally oriented reversing bodies and with the reversing bodies being movable vertically and relative to the allocated filter cloth by means of two lifting elements of a lifting apparatus, with said lifting elements being arranged on two opposite longitudinal sides of the filter press and being couplable to carriers of the reversing bodies, with said carriers protruding on the face side.

From DE 195 46 701 A1, a filter press is known which is suitable for fully automatic operation and in which the lifting elements are arranged as lifting beams extending over the entire length of the packet of filter plates. Said lifting beams are not displaceable in the longitudinal direction of the filter press, but can be lifted or lowered vertically to the press frame in order to allow an upward and downward movement of the same as a result of the coupling with the carriers of the reversing bodies which are arranged as pairs of rollers. In the course of the vertical upward movement of the pairs of rollers a displacement of the S-shaped wrap of the filter cloth occurs, so that any adhering filter cake is detached and will fall down as a result of the small radius of curvature in the zone of the rollers.

The disadvantages of said known filter press are that the lifting apparatus needs to be designed very massively due to the simultaneous vertical movement of all pairs of rollers and that with

such a filter press it is merely possible to provide a limited filter output, because the number of filter plates and thus the available filter surface is limited.

A further development of the above-mentioned filter press is known from DE 197 45 289 C1. It concerns a filter press of the kind mentioned above in which the filter plate packet is subdivided into several sections and in which the lifting apparatus is provided with carriages for the carriers which are horizontally displaceable in lifting rails and merely ensure the coupling of the carriers of a section of filter plates with the lifting apparatus. There is accordingly a sectional and sequential detachment of the filter cake from the filter cloths which can be realized with a weaker dimensioned lifting apparatus which can thus be produced in a more cost-effective manner.

Despite the unquestionable improvement, the filter press as disclosed in DE 197 45 289 C1 still shows certain disadvantages. For example, the accessibility to the filter plates is made difficult by the lifting rails which extend over the entire length of the packet of filter plates. Moreover, the masses of the parts moved during the discharge of the cake, which although reduced in comparison with the filter press according to DE 195 46 701 A1, are still rather large, so that the complexity and the costs for the lifting apparatus are in total still high.

The invention is based on the object of providing a filter press with sectional and sequential detachment of the filter cake from the filter cloths of the same in which a favorable lateral accessibility to the individual is given as required and, moreover, the complexity of the lifting apparatus for the reversing bodies is reduced.

Based on a filter press of the kind mentioned above, this object is achieved in accordance with the invention in such a way that the lifting apparatus extends in total in the direction of a

According to an embodiment of the filter press in accordance with the invention it is provided that the lifting apparatus is a lift-truck which is displaceable on the upper horizontal longitudinal beams of the holder and is provided with two vertically aligned side parts which extend laterally next to the filter plate packet and in which lifting elements are guided. The longitudinal beams, which are present in the press holder in any case, are ideally suitable as a bearing structure for the lift-truck. The lateral guidance of the lifting elements in the vertically aligned side parts

allows the simple use of traction mechanism drives for the vertical movement of the lifting elements, e.g. in form of chain or cable drives.

A further development of the invention is that the lifting elements are provided with receiving elements whose central distance corresponds to the distance of the carriers of the reversing bodies when two adjacent filter plates are spaced at a distance which is defined by the connecting brackets and is necessary for the cake discharge. The total number of filter plates corresponds to an integral multiple of the number of the receiving elements of the lifting elements.

Appropriately, the carriers are arranged in the reversing bodies as horizontally aligned pins and the receiving elements on the lifting elements as tappets which extend vertically upward from a horizontally aligned basic body of the lifting element.

It is provided for in a further development of the invention that the lift-truck is provided with an unlatching device which is adjustable vertical to the same, whereby a switching force for unlatching the connecting bracket can be exerted by means of the contact surfaces of the unlatching device on the switching surfaces of connecting brackets which are flexibly connected to a filter plate each.

In this way it is possible to unlatch the connecting brackets of merely the section in which the cake discharge is to take place and above which the lift-truck is disposed at such time. Due to the vertical displaceability of the unlatching device relative to the lifting truck, the same can be moved at first above the filter plate packet in such a way that the switching surfaces of the connecting brackets are not touched and the filter plates remain mutually locked.

Appropriately, the contact surfaces are arranged as runners and the unlatching device can be swiveled by means of a fluid cylinder from an idle position in which the contact surface is disposed above the switching surfaces to a switching position in which the connecting brackets are unlatched.

In order to produce a thorough cleaning both of the filter cloth as well as the reversing body after the discharge of the filter cake, it is proposed that at least one spray pipe is flexibly mounted on the lifting element which can be transferred from an idle position in which it is disposed vertically and completely outside of a projection of the filter plates in the longitudinal direction of the filter press to a cleaning position in which it is approximately horizontal. The filter cloth can then be charged over its entire width with a pressurized cleaning liquid emerging from the nozzle of the spray pipe under pressure. The vertical upward and downward movement of the spray pipe thus ensures that the entire surface of the filter cloth can be cleaned.

This allows positioning the spray pipe during the detachment process of the filter cake outside of the intermediate space which exists between the filter plates and to swivel the spray pipe into the intermediate space only during the fluid-supported cleaning process. In the position when swiveled in the spray pipe can easily assume a position which would not be possible during the filter cake discharge due to the falling parts of the filter cake.

Appropriately, the number of the filter cloths which can be cleaned during a lifting movement is smaller than the number of the receiving elements present in a lifting element.

Since the volume flow of the cleaning fluid which is required for the thorough cleaning of the filter cloths is relatively high, the totally required volume flow can be limited when only a few filter cloths are cleaned simultaneously. The pump output which needs to be provided can

Whereas based on a position in which all filter plates rest against one another the first section is to be opened with the help of the hydraulic closing mechanism of the filter press, this is no longer the case when the filter plates of the second section are pulled apart, since simultaneously with this it is necessary to push together again the filter plates of the previously emptied first section. In summary, the press holder is only dimensioned in its length in such a way that the filter plates of a single section can be pulled apart to the emptying distance.

Preferably, the transport apparatus for the cake discharge is attached to the unlatching device of the lift-truck because this leads to the advantage of smaller required actuating paths and ranges as compared with a transport apparatus which is rigidly attached to the holder. The connection of the transport device with unlatching device offers the possibility in this connection to make the

coupling of a transmission part of the transport apparatus with carriers on the filter plate dependent on the lower position of the unlatching device, i.e. on the unlatched state of the filter plates.

In order to prevent the escape of possibly swelling filter cake from the first filter chamber of the as yet unopened section, it is further provided that the lift-truck is provided with a latching device with which the filter plate which is adjacent to the section of filter plates to be emptied and cleaned can be fastened relative to the lift-truck. The lift-truck is fastened relative to the press holder during the emptying and cleaning process.

The plate transport in filter cloth cleaning occurs other than in the plate transport for the purpose of cake discharge by grasping the tappet of the first plate of the packet to be cleaned next by a carrier fastened to the pivoted unlatching apparatus in conjunction with the movement of the entire lift-truck. For this purpose, a carrier which is fastened to the unlatching device can be brought into engagement with the tappet of the filter plate.

The differences of the plate transport during the cake discharge and during the filter cloth cleaning are explained by the fact that the plate transport during the cake discharge is performed starting at the pressure plate in the direction of the same. During the filter cloth cleaning, however, the plate transport starts in the last plate section at the support plate side in the direction of the same in order to avoid any idle time, which means in the opposite direction as during the cake discharge.

The invention is now explained in closer detail by reference to an embodiment of a filter press shown in the drawings, wherein:

Fig. 2 shows a front view in a sectional view along line II-II of the filter press according to fig. 1, and

The filter press 1 as shown in the figs. 1 and 2 for the filtration of suspensions consists substantially of a holder 2 anchored to the floor, a support plate 3 fastened thereto and a pressure plate 5 which is held in a horizontally displaceable manner on longitudinal beams 4 of the holder 2 and which can be pressed with the help of four fluid cylinders F which are disposed on the face side in the direction towards the support plate 3. A packet of vertically aligned filter plates 6 which are also held in a suspended way on the longitudinal beams 4 is disposed between the pressure plate 5 and the support plate 3. A filter chamber is delimited by two adjacent filter plates 6 in the state when pressed together, which filter chamber can be closed off in a pressure-tight way with the help of projecting membrane enlargements extending along the edge and can be charged with the pressurized suspension to be filtered.

As is shown in the figures 3 to 5, the packet of the filter plates 6 consists of chamber plates 6K and membrane plates 6M which are arranged alternately one after the other. A filter cloth 7K of the chamber plate 6K and a filter cloth 7M of the membrane plate 6M form a seal of a filter chamber in both directions, so that during the passage of the suspension through the pores of the filter cloths 7K and 7M the solids to be filtered out are held back in the filter chamber, whereas the filtrate is guided through the chamber plate 6K and the membrane plate 6M to a filtrate outlet. The filter cloth 7K of a chamber plate 6K is tensioned below the same by a rod-shaped

With respect to figs. 1 and 2, it can be seen that the filter press 1 comprises a lifting apparatus in form of a lift-truck 12 which is displaceable by means of a rack-and-pinion gear combination (not shown) on the longitudinal beams 4 of the frame 2 in the horizontal direction. The drive of the pinion R is performed with the help of electromotor 17'. The lift-truck 12 is U-shaped, with the two free U-legs extending in the vertical direction in the form of side parts 13 next to the longitudinal sides of the filter press 1. A vertical displaceable lifting element 14 each is guided in the side parts 13 which are rigidly connected with the other lift-trucks 12. The lifting elements 14 extend in the longitudinal direction of the filter press 1 merely over the length of eight adjacent filter plates 6 for example.

In the upper zone of the lift-truck 12, the same is provided with a vertically adjustable unlatching device 25. The unlatching device 25 is disposed between the two horizontal longitudinal beams 4 and is displaceable in the vertical direction while maintaining its horizontal alignment with the help of a fluid cylinder 26 fastened to the lift-truck 12. This is carried out via respectively disposed articulated levers.

The unlatching device 25 is provided with runner-like contact surfaces 27 with which in the lowered state of the unlatching device 25 a switching force can be exerted for unlatching connecting brackets which connect adjacent filter plates 6. In this way the filter plate packet can remain latched at first after the actual filtration process. The unlatching of the connecting brackets is performed for merely those filter plates 6 which belong to the section to be emptied at the time.

The unlatching device 25 is further provided with a transport device 28 which consists of a fluid cylinder 29 and a carrier element 30 fastened to the end of its piston rod. The carrier element 30 can be brought into contact with the tappets 31 of the filter plate suspension in the lowered state of the unlatching device 25. In this way, the filter plates of an entire section can be pulled apart to the discharging distance by acting upon a single filter plate 6 as a result of the coupling of the filter plates 6 by means of the connecting brackets.

The functional sequence during a discharge and optional cleaning process is described below:

Based on a position of the filter plate packet which is pressed together into a block, the lift-truck 12 is moved to the end of the plate packet facing the pressure plate 5 or is already situated there during the filtration process. An unlatching device 33 which is disposed on the side parts 13 of the lift-truck 12 is used to arrest the first filter plate 6 of the second still closed section on the lift-truck 12 and thus on the holder 2. This prevents that swelling filter cakes will press apart the filter plates 6 of a closed section. After lowering the unlatching device 25, the filter plates 6 of the first now unlocked section are pulled apart to a discharge distance by moving the pressure plates 5 with the fluid cylinder F.

For the purpose of emptying the filter chambers of the next section, the lift-truck 12 is moved at first by the respective amount in the longitudinal direction of the filter press 1. The filter plates of this section are unlatched by lowering the unlatching device 25. The filter plates 6 of the unlatched section are pushed apart by the transport device 28, with the filter plates 6 of the previously emptied section being pushed together again. The above process is repeated section by section until all filter chambers have been emptied.

This is followed by a renewed upward and downward movement of the lifting elements 14, through which only two filter chambers each are cleaned simultaneously, because merely two spray pipes 24 are present in order to reduce the volume flow of the cleaning liquid and thus the pump output that needs to be provided for this purpose. The carriers 21 of the other chamber plates 6K are not included in this lifting movement because they are located in the intermediate spaces between the receiving elements 18.

The cleaning of the other filter chambers occurs after the lift-truck 12 has been displaced by the required amount horizontally in the direction of the pressure plate. The unlatching device 25 is then swiveled to the unlatching position. A carrier 34 disposed on the unlatching device 25 grasps the tappet 31 of the first plate of the closed plate packet. In the next step the lift-truck 12 is moved in the direction towards the support plate 3, thus opening the next chambers to be cleaned and simultaneously closing the two previously cleaned chambers. This process is repeated until all filter chambers have been cleaned.

Claims:

1. A filter press (1) for filtering suspensions, consisting of a holder (2), a support plate (3) fixed thereto, a displaceable pressure plate (5) and a packet of vertical filter plates (6) which are arranged between the support plate (3) and the pressure plate (5), with each filter chamber situated between two filter plates (6) each comprising at least one filter cloth (7K) which is guided in an S-shaped manner around two horizontally oriented reversing bodies (10) and with the reversing bodies (10) being movable vertically and relative to the allocated filter cloth by means of two lifting elements (14) of a lifting apparatus, with said lifting elements being arranged on two opposite longitudinal sides of the filter press (1) and being couplable to the carriers (21) of the reversing bodies (10), with said carriers protruding on the face side, characterized in that the lifting apparatus extends in total in the direction of a longitudinal axis of the filter press (1) merely over a partial zone of the length of the filter plate packet and is movable in the direction of the longitudinal axis of the filter press (1), with the lifting elements (14) being movable relative to the lifting apparatus merely in the vertical direction.
2. A filter press as claimed in claim 1, characterized in that the lifting apparatus is a lift-truck (12) which is displaceable on the upper horizontal longitudinal beams (4) of the holder (2) and is provided with two vertically aligned side parts (13) which extend laterally next to the filter plate packet and in which the lifting elements (14) are guided.
3. A filter press as claimed in claim 1 or 2, characterized in that the lifting elements (14) are provided with receiving elements whose central distance corresponds to the distance of the carriers (21) of the reversing bodies (10) which is present when two adjacent filter plates (6) are spaced at a distance which is defined by the connecting brackets, with the total number of filter plates (6) corresponding to an integral multiple of the number of the receiving elements

of the lifting elements (14).

4. A filter press as claimed in claim 3, characterized in that the carriers (21) are arranged as pins and the receiving elements (18) are arranged as tappets which extend in an upwardly perpendicular manner from a horizontally aligned basic body (19) of the lifting element (14).
5. A filter press as claimed in one of the claims 1 to 4, characterized in that the lifting elements (14) comprise recuperating elements (23) which produce a positive-locking connection with the carriers (21) during the downward movement of the lifting elements (14).
6. A filter press as claimed in one of the claims 1 to 5, characterized in that the lift-truck (12) is provided with an unlatching device (25) which is adjustable vertical to the same, whereby a switching force for unlatching the connecting brackets can be exerted between mutually adjacent filter plates (6) by means of the contact surfaces (27) of the unlatching device (25) on the switching surfaces of connecting brackets which are flexibly connected to a filter plate (6) each.
7. A filter press as claimed in claim 6, characterized in that the contact surfaces (27) are arranged as runners and the unlatching device (25) can be swiveled by means of a fluid cylinder (26) from an idle position in which the contact surfaces (27) are disposed above the switching surfaces to a switching position in which the connecting brackets are unlatched.
8. A filter press as claimed in one of the claims 1 to 7, characterized in that at least one spray pipe (24) is flexibly mounted on the lifting element (14), which spray pipe can be transferred from an idle position in which it is disposed vertically and completely outside of a projection of the filter plates (6) in the longitudinal direction of the filter press (1) to a cleaning position

9. A filter press as claimed in claim 8, characterized in that the number of filter cloths (7) which can be cleaned during a lifting movement is smaller than the number of receiving elements (18) present on a lifting element (14).

10. A filter press as claimed in one of the claims 8 or 9, characterized in that at opposite longitudinal sides of the filter press (1) one spray pipe (24) each is disposed which is assigned to the same intermediate space and the spray pipes (24) are aligned in their cleaning position with their longitudinal axes coaxially with respect to one another.

11. A filter press as claimed in one of the claims 1 to 10, characterized in that a transport device (28) for displacing one or several filter plates (6) is fastened to the lifting apparatus when the same is stationary in the longitudinal direction of the filter press (1).

12. A filter press as claimed in the claims 11 and 6, characterized in that the transport device (28) for the cake discharge is fastened to the unlatching device (25) of the lift-truck.

13. A filter press as claimed in one of the claims 2 to 12, characterized in that the lift-truck (12) is provided with a latching device with which the filter plate (6) which is adjacent to the section of filter plates (6) currently to be emptied can be fixed relative to the lift-truck (12).

14. A filter press as claimed in one of the claims 6 to 13, characterized in that a carrier (34) which is fastened to the unlatching device (25) can be brought into engagement with the tappet (31) of the filter plates (6).

Abstract:

The invention relates to a filter press (1) for filtering suspensions. Said press consists of a holder (2), a support plate (3) fixed thereto, a displaceable pressure plate (5) and a packet of vertical filter plates (6) that are arranged between the support plate (3) and the pressure plate (5). Each filter chamber that is situated between two filter plates (6) is defined by at least one filter cloth (7K) which is guided in an S-shaped manner around two horizontally oriented reversing bodies (10). The reversing bodies (10) can be moved vertically and in relation to the allocated filter cloth (7) by means of two lifting elements (14) of a lifting device. Said elements are arranged on two opposite longitudinal sides of the filter press (1) and can be coupled to carriers (21) which protrude on the face and pertain to the reversing bodies (10). The aim of the invention is to improve access to the filter plates (6) and reduce the constructional complexity of the lifting device. To this end, the length of the lifting device only amounts to a fraction of the length pertaining to the filter plate packet, whereby said first length is parallel in relation to a longitudinal axis of the filter press (1). The lifting device can be moved in parallel to the longitudinal axis of the filter press (1) and is rigidly connected to the lifting elements (14) in said direction.

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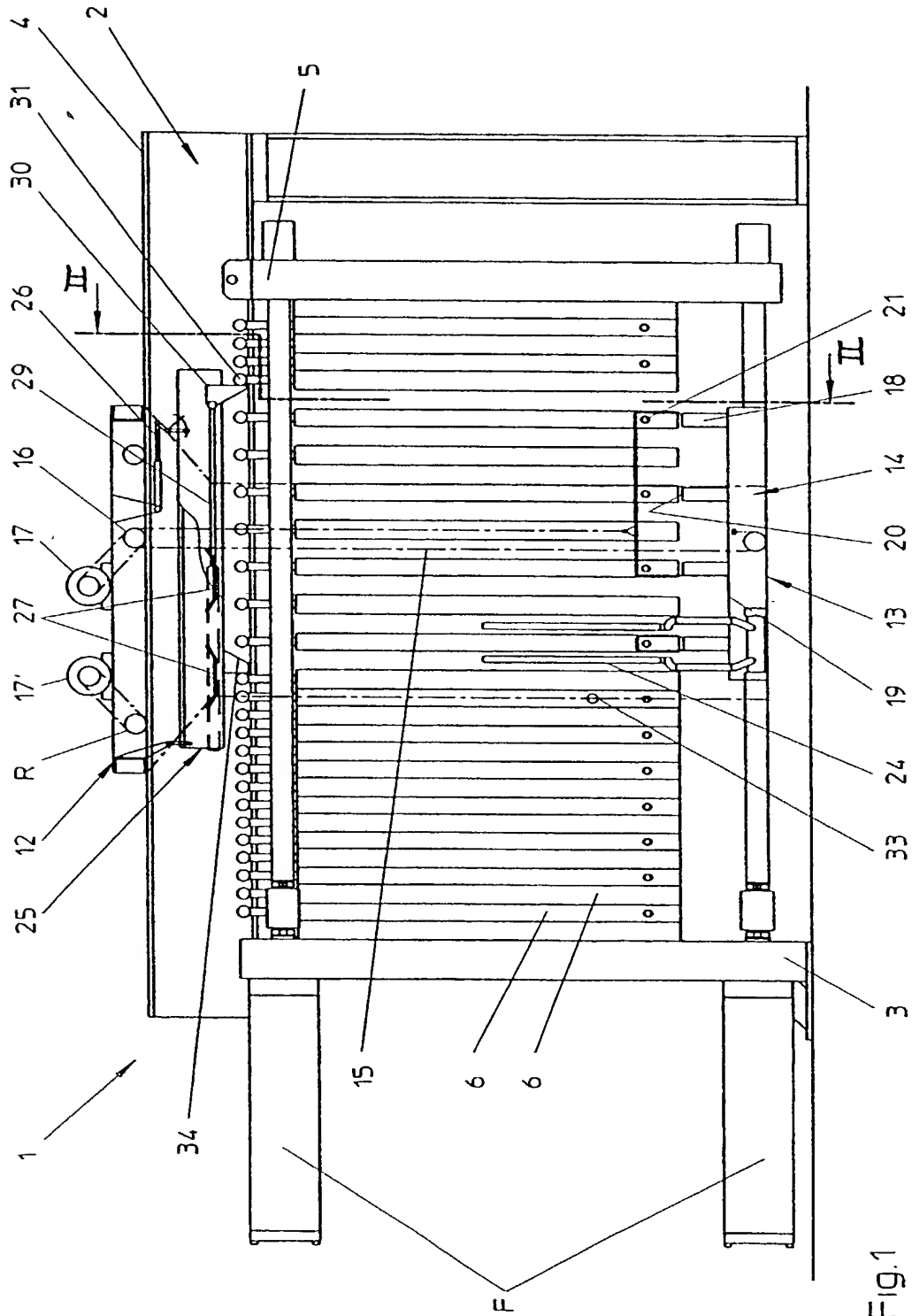


Fig. 1

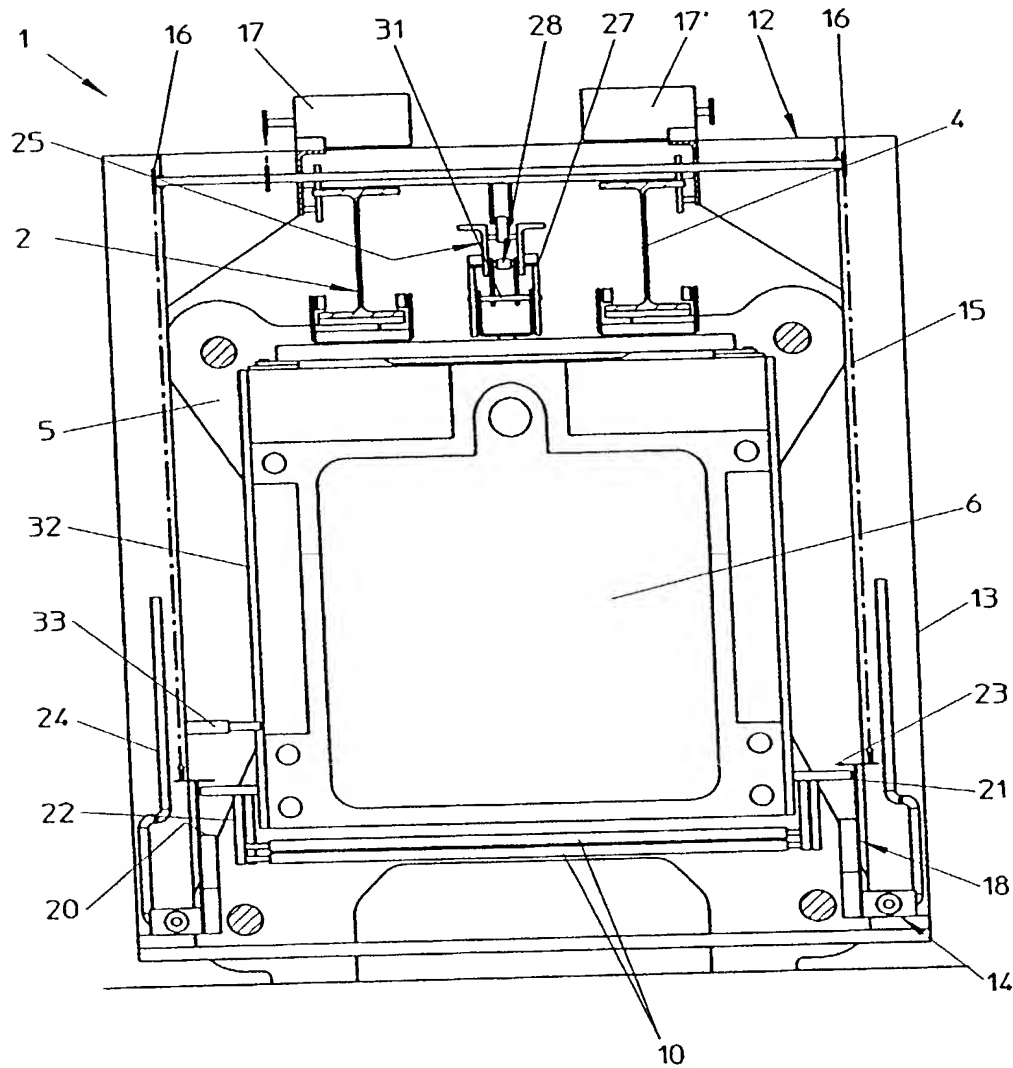


Fig.2

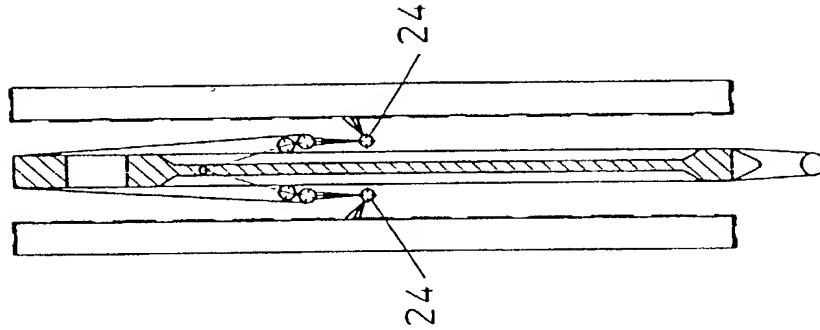


Fig. 5

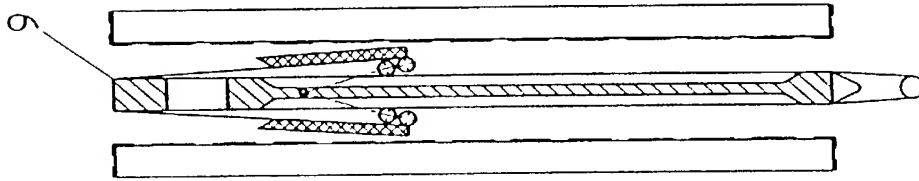


Fig. 4

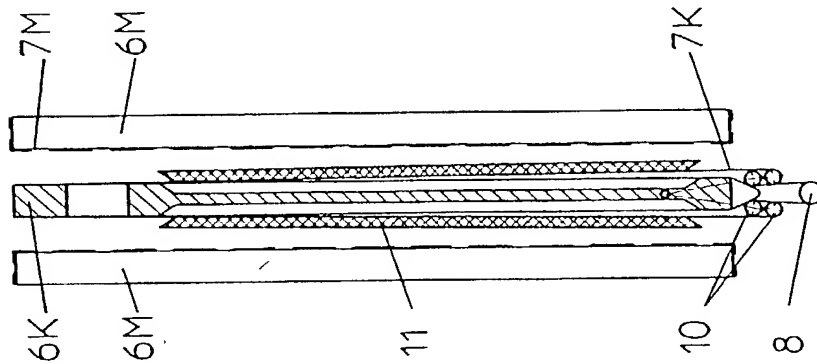


Fig. 3

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**DECLARATION FOR UTILITY OR
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PATENT APPLICATION
(37 CFR 1.63)****WITH POWER OF ATTORNEY**

- ☐ Declaration Submitted with Initial Filing
- OR
- ☐ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number	4322
First Named Inventor	Wilhelm Claessen
COMPLETE IF KNOWN	
Application Number	/
Filing Date	
Group Art Unit	
Examiner Name	

As a below named inventor, I hereby declare that:

My residence, mailing address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

FILTER PRESS

(Title of the Invention)

the specification of which

☐ is attached hereto

OR

☒ was filed on (MM/DD/YYYY) 08/18/2000 as United States Application Number or PCT International

Application Number PCT/DE00/02828 and was amended on (MM/DD/YYYY) (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
199 44 848.5	Fed. Rep. of Germany	09/18/1999	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

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I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)	<input type="checkbox"/> Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

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U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

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As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: ☒ Customer Number 021553

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DECLARATION

ADDITIONAL INVENTOR(S)
Supplemental Sheet
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